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QUALITY PRODUCTION OF BARLEY

W. W. Brookins

AGRICULTURAL EXTENSION DIVISION
UNIVERSITY OF MINNESOTA

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University Farm St. Paul Minnesota

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Market Quality Program

W. W. Brookins,
Extension Agronomist

Introduction. The program was established and is being conducted to aid farmers, elevator operators and local crop organizations in improving the quality and thereby the sale value of grain crops. Reference in this publication is to the phase conducted by the Agricultural Extension Division. In a broad interpretation, quality production includes also the basic research and experimental work conducted by the experiment station in the development of new varieties, the search for, or testing of, older varieties which meet the requirements of the grain trade and production requirements on the farm. Quality production on the farm depends largely upon the general use by farmers of good seed stocks of suitable varieties, favorable crop seasons, good cultural practices, and proper handling of the crop at, and following harvest.

In many respects the program is a campaign to encourage the greater utilization, more rapid and complete adoption of those better, recommended varieties already in the hands of crop improvement association members and farmers rather than for the introduction of new varieties. The program was established in 1936 more or less in its present form. Prior to this time, the Northwest Crop Improvement Association in cooperation with the Federal Grain Supervision Office, Minneapolis, and the Agricultural Extension Division conducted meetings along similar lines. An inspection service of farm samples was used to illustrate federal grain standards, and use of pure seed was considered in relation to activities of the Minnesota Crop Improvement Association.

The present program has grown out of the earlier experiences with this work. In the past three years 43 counties have conducted some phase of the program, five have carried their program thru three years and 10 counties thru the last two years. Fifteen counties adopted the program for the first time in 1938-39. Some of these latter counties have engaged at times in various crop improvement activities which are reflected in the apparent quality of their crops.

The sale and purchase of barley suitable for malting has been a source of dissatisfaction for the producer, the elevator operator, as well as the commercial groups which process the crop. All groups have sustained financial losses in the handling of the crop at one time or another. It is hoped to reduce these losses and improve farm income by aiding farmers in the production of a higher quality product.

In view of the more or less independent nature of the farm business, one of the chief problems encountered has been to bring about closer cooperation between farmers, and between farmers and elevator operators. The second obstacle has been low quality of the crop in general. Aside from the effect of season there are a number of factors under farm control which require consideration.

The program has also included a limited amount of work on wheat, with increasing attention to flax. There is ample evidence that the oat and winter wheat crops require similar improvement. Various phases of the program can be adapted satisfactorily to these crops.

Present Situation. In 1938-39, thirty counties surveyed were using from two to eight varieties of barley, and a ninth which may be termed mixed. Mixed varieties were found more frequently in those counties growing several varieties, where a lower percentage of registered seed was used, or where the program had not been in operation. (Table I.) There were exceptions to this however. Previous data gathered showed 10 varieties of barley in the state, 12 counties using four to six, and 19 counties from one to three. Mixtures of rough and smooth bearded varieties are objectionable to maltsters as they possess different rates of germination, plumpness, mealiness, percentage of hull and other qualities, and are so variable that a uniform malt is not possible. With several varieties in a community mixtures are inevitable, and the marketing of uniform cars is greatly complicated.

The variety situation in other crops is much the same. A survey of the county fair premium lists in 1938 indicated that many unsuitable varieties and types were being encouraged by premium lists in need of revision. Over 15 per cent of the counties offered premiums for two-row barley. At least five of these counties were located in the heart of the malting area. Sixteen classifications in barley and 18 in wheat were found in use. A revised standard premium list was prepared and submitted to county fair boards thru the cooperation of the Minnesota Federation of County Fairs. It is the opinion of the writer that premium lists which encourage the use of recommended varieties will assist in weeding out unsuitable varieties in all crops.

Analysis of Farm Samples of Barley. During the fall and winter, farmers submitted samples of their barley crop to be analyzed for variety, purity, mixtures of types, and of other classes of grain, weed content, threshing damage, blight heat and sprout damage, etc. Recommendations were made regarding the desirability of the samples for seed based upon the analysis. Samples containing a trace of some other variety, or where an occasional kernel of two-row and Trebi was found were considered suitable. Detectable mixtures which amounted to two and three per cent were accepted but the grower was encouraged to secure new seed as soon as convenient. Mixtures of five per cent or more were definitely discouraged, particularly in the case of two-row and Trebi. On the assumption that the crop to be grown from seed similar to the sample would possess a number of other features which would detract from its sale value, such as maximum limit of blight, or possibly was only 75 per cent mellow, a mixture of five per cent of another variety might in some seasons be sufficient to adversely affect the sale of it. Most of the Manchuria and Oderbrucker found had been on farms upwards of 30 years or more and contained too many mixtures of types to be recommended for planting. Glabron was discouraged as a malting variety as the market objects to it.

Oat and wheat mixtures of over two per cent were considered undesirable and where this amounted to five per cent the sample was not recommended. A sample containing five per cent oats plus four per cent blight damaged barley is considered to be 91 per cent sound barley, which definitely limits the crop to number 3 malting. This grade provides a range of 90 to 93 per cent sound barley. Likewise a sample containing two per cent oats plus four per cent blight damaged barley is considered to be 94 per cent sound barley with a grade limitation of number 2 malting.

Except in cases where samples showed a high per cent of blight damage, or were so closely threshed as to injure the germ or were heat damaged, these items did not enter into seed recommendations. Likewise weed content of a separable nature, or which was not made up of noxious weeds was not considered except as a basis to recommend cleaning before seeding. Weight per bushel and per cent of undersize were not recorded as these factors vary greatly with the season, and are less readily controlled by farmers.

Most of the samples were examined in the laboratory prior to the county meeting. During 1936-37, analysis was made at meetings. The number of samples per meeting varied from zero to 75. A total of 680 samples was inspected. In 1937-38, 1,376 samples of barley and wheat were handled mostly prior to the meeting, with a total of 10 to 141 per meeting. This plan was again followed in 1938-39 with 1,735 samples reported on, the numbers ranging from 23 to 178 per county. Six counties submitted 75 or more samples per meeting, nine counties 50 to 75, and 15 counties less than 50. The advance collection of samples appears to be more efficient in cost of operation, and makes it possible to reach a larger number of farmers without impairing the effectiveness of the program.

The statistical value of the data is greatly improved with larger number of samples, and a better measure of seed quality in a county is obtained. In Minnesota many counties have submitted less than 50 samples per meeting, even where they were collected in advance. The number of samples submitted appears to be a fair measure of interest within the county and provides a measure for determining if meetings shall be held. In 1938-39, 13 counties submitting less than 50 samples had an average attendance of 80 per meeting; 14 counties submitting more than 50 samples had an average attendance of 140. In order to obtain a sufficient number of samples per county to provide reliable data, evidence obtained to date indicates that sample collection should be carried on several months in advance of meetings. Furthermore this serves as good publicity for meetings.

Samples were collected by the county agent assisted by elevator operators, vocational agricultural instructors, and farmers. Analysis was performed by the Federal Grain Supervision Office, Minneapolis, and the Minnesota Agricultural Extension Division cooperating. Excepting in one case, the samples were returned to farmers at the time of the meeting, and an explanation and demonstration of the analysis made to owners of samples. Farmers who could not be present at the meetings later received their reports and explanations from the county agent. Many favorable comments have been received from farmers on this service. R. H. Black, formerly Federal Grain Supervisor at Minneapolis, made a survey of Minnesota farmers who had received this service during 1937-38. Ninety-two per cent were strongly in favor of it, and eight per cent not in favor or opposed to the work. Further investigation of those opposed revealed that they were individuals whose grain was badly mixed or who were growing inferior varieties.

Summary of Barley Sample Inspections and Meetings. Barley samples were inspected and reports prepared for 34 counties. Thirty-two meetings were conducted in 28 counties. Attendance at meetings averaged 137 compared with 78 in 1937-38, or an increase of 75 per cent. A total of 1,735 samples was inspected compared with 1,142 in 1937-38 or an increase of 52 per cent in volume of service performed.

An increase of 11 per cent in recommended seed is indicated. Mixed varieties decreased 10 per cent, samples with mixtures of oats and wheat decreased five per cent, and samples containing a trace or more of two-row barley decreased 20 per cent. (Table I.)

The trend of varieties is toward Wisconsin 38, which increased 26 per cent, while Oderbrucker and Manchuria decreased 15 per cent. All rough awned varieties decreased 13 per cent. (Table I.)

Table I. Summary of Barley Samples Inspected for Grain Schools 1938-39

	Carver	Cottonwood	Dakota	Dodge	Faribault	Fillmore	Goodhue	Houston	Jackson	Kittson	Lac qui Parle	Le Sueur	Lyon	Martin	Marshall
Meetings	1	1	2	-	1	1	2	-	1	1	1	1	1	1	1
No. Farmers Present	50	30	185	-	40	50	1285	-	85	200	130	25	100	100	50
No. Samples Inspected	30	25	33	27	58	52	38	31	105	32	60	23	36	53	96
% Recommended for Seed	57	92	73	70	84	71	84	65	96	87	53	70	83	81	36
% Not " " "	43	8	27	30	16	29	16	35	4	13	47	30	17	19	64
% Velvet	30	8	39	17	21	11	16	13	7	3	5	17	6	15	1
% Wisconsin 38	33	88	40	70	74	83	76	74	92	66	63	62	81	75	39
% Glabron	20	-	3	9	2	-	3	7	-	-	2	17	6	2	1
% Smooth Awned	83	96	82	96	97	94	95	94	99	69	70	96	93	92	41
% Old Style*	10	-	10	4	-	4	3	6	-	19	28	4	7	8	36
% Rough Awned	17	4	18	4	3	6	5	6	1	31	30	4	7	8	59
% Mixed	17	8	12	19	7	8	8	13	5	6	13	9	6	8	25
% With over 2% Blight	40	64	58	-	84	85	24	-	55	25	55	48	25	72	16
% With over 2% Oats and Wheat	13	4	3	-	21	13	18	-	8	6	27	30	8	11	13
% Mixed with 2-row	7	4	18	19	2	4	8	23	5	-	3	-	3	2	11
% With 5% or over Skinned and Broken	23	28	15	-	24	35	26	-	21	66	43	26	31	19	46

(Continued) Table I. Summary of Barley Samples Inspected for Grain Schools 1938-39.

	McLeod	Mower	Murray	Nicollet	Olmsted	Redwood	Renville	Scott	Steele	Swift	Wabasha	Waseca	Winona	Wright	Yellow Med.	Totals and Per Cent	1937-38 Totals and Per Cent
Meetings	1	1	1	1	2	1	1	1	1	2	1	1	1	1	1	32	26
No. Farmers Present	150	100	45	51	235	110	300	70	100	325	65	135	70	135	160	4381	2019
No. Samples Inspected	86	40	59	21	137	59	86	42	33	178	38	58	49	64	86	1735	1142
% Recommended for Seed	52	58	88	67	75	80	70	88	70	56	79	72	55	42	67	71	60
% Not " " "	48	42	12	33	25	20	30	12	30	44	21	28	45	58	33	29	40
% Velvet	26	5	2	5	5	4	12	26	6	4	8	26	5	15	8	12	20
% Wisconsin 38	51	80	93	81	85	89	74	64	72	66	86	67	75	44	76	71	45
% Glabron	19	5	3	9	5	5	11	10	16	6	3	2	4	14	9	6	11
% Smooth Awned	96	90	98	95	95	98	97	100	94	76	97	95	84	73	93	89	76
% Old Style*	4	10	2	5	5	2	1	-	6	23	3	5	16	25	5	8	23
% Rough Awned	4	10	2	5	5	2	3	-	6	24	3	5	16	27	7	11	24
% Mixed	22	13	7	14	7	8	12	2	6	13	3	3	27	22	15	11	21
% With over 2% Blight	47	62	32	43	62	59	52	50	61	31	66	66	49	63	49	52	2
% With over 2% Oats and Wheat	29	45	17	10	20	20	30	7	18	31	16	19	12	28	22	18	23
% Mixed with 2-row	15	23	10	10	9	10	8	2	6	15	5	7	31	5	-	9	29
% With 5% or over Skinned and Broken	28	8	25	14	26	32	27	7	33	40	13	21	22	17	36	27	-

*Includes Oderbrucker and Manchuria.

Analysis of One, Two and Three-Year Results. Considering the data from individual counties it must be recognized that the number of samples reported is small in most cases. The results are regarded as indicating progress. Five counties, - Dakota, Goodhue, Jackson, Winona and Yellow Medicine have carried the program thru three years. Comparative figures of per cent of samples recommended each year, and total number of samples analyzed per county are given in Table II. For the two-year and one-year data, five counties were selected which provided the largest number of samples inspected in both years. Counties initiating the program in 1938-39 showed a range of 36 to 75 per cent of their seed suitable for planting; counties cooperating two years, the range was 79 to 92 per cent; and three years 60 to 96 per cent. Jackson county was outstanding showing 61 per cent, 45 per cent and 96 per cent recommended in the three years, with 161, 141, and 105 samples inspected respectively. This county showed an increase of 35 per cent of samples recommended over the first year's data and 51 per cent over the second year. These results appear to be significant.

Table II. Comparison of 15 Counties Carrying Program One, Two, and Three Years

Counties:	Dakota		Goodhue		Jackson		Winona		Yellow Medicine	
Years	% Rec.	No. Samples	% Rec.	No. Samples	% Rec.	No. Samples	% Rec.	No. Samples	% Rec.	No. Samples
1936-37	50	36	76	82	61	161	71	56	64	14
1937-38	70	70	81	122	45	141	79	89	52	159
1938-39	94	32	96	20	96	105	60	49	67	86
Counties:	Faribault		Cottonwood		Redwood		Scott		Wabasha	
Years	% Rec.	No. Samples	% Rec.	No. Samples	% Rec.	No. Samples	% Rec.	No. Samples	% Rec.	No. Samples
1937-38	80	20	69	137	43	41	50	44	68	48
1938-39	84	58	92	25	80	59	88	42	79	38
Counties:	Marshall		McLeod		Olmsted		Renville		Swift	
Years	% Rec.	No. Samples	% Rec.	No. Samples	% Rec.	No. Samples	% Rec.	No. Samples	% Rec.	No. Samples
1938-39	36	96	52	86	75	137	70	86	56	178

Use of Registered Seed by Farmers. At the time samples were collected a survey was made as to the origin of seed used and the frequency farmers purchased new seed. Regular replacement of mixed varieties in communities is essential to any permanent progress in improving the quality of malting barley produced there. Furthermore, the frequency with which farmers replace their seed with pure stocks has a direct bearing on the maintenance of reasonable purity on individual farms. In 1937-38, 417 farmers reported that seed in use had been on their farms an average of 4.0 years. During the season of 1938-39, 1,012 farmers reported an average figure of 2.74 years. The average number of years seed had been in use by counties varied from 1.14 years to 4.74 years. These data are reported in Table III. Numbers of samples per county were too few to determine significant differences between counties. These figures will serve to emphasize the importance of counties securing more complete data on samples submitted in the future. It is evident, however, that farmers have replaced old seed on the farm during the past two years. This is also borne out in the 26 per cent increase of Wisconsin 38, the decrease of 20 per cent of two-row mixed seed and 10 per cent decrease of mixed varieties, (Table I.)

Table III. Average Number of Years in which Farmers Retain Barley Seed Stocks in 24 Minnesota Counties

County	No. of Samples	Total Years All Samples	Average Number Years On Farm	County	No. of Samples	Total Years All Samples	Average Number Years On Farm
Carver	19	66	3.47	Martin	47	114	2.43
Dakota	14	16	1.14	McLeod	83	338	4.07
Dodge	24	53	2.21	Murray	38	87	2.29
Faribault	51	138	2.71	Nicollet	19	90	4.74
Fillmore	31	83	2.68	Olmsted	90	193	2.14
Goodhue	21	50	2.38	Redwood	25	49	1.96
Jackson	31	77	2.48	Renville	78	219	2.81
Kittson	20	53	2.65	Swift	109	249	2.28
Lac qui Parle	52	132	2.54	Wabasha	36	111	3.08
Le Sueur	19	54	2.84	Waseca	27	60	2.22
Lyon	32	102	3.19	Winona	23	62	2.70
Marshall	83	270	3.25	Wright	40	112	2.80

Aver. no. of years for barley seed stocks on farms for 24 Minnesota counties 2.74

In 1937-38, 417 farmers in 18 counties reported 24 per cent using registered stock as source of their seed. In 1938-39, 1,004 farmers in 24 counties reported 19.6 per cent using registered seed. Several counties which appeared to have used from 22 to 32 per cent, showed very favorable county reports on quality. On account of the incomplete and limited nature of the data it was not possible to reach any definite conclusions. It appears reasonable to expect that counties using more registered seed would show less mixed varieties, less two-row mixtures, and a higher percentage of seed recommended for planting. Counties using a high percentage of farm-run seed have replaced with Wisconsin 38 as was evident in Table I. Much of the seed of this variety available in the state during the past two or three years was one to two years removed from registered seed. Thus, while counties have used farm-run seed it is evident that this seed was of greater purity than most of the farm varieties which had been on farms from 10 to 35 years or more. The data for counties are summarized in Table IV. It was evident from the number of samples received with incomplete data and varieties misnamed that many farmers pay little attention to their variety or to the quality of seed used.

Malting Barley Areas. Surveys of the origin of malting barley receipts at the principal markets for August and September, 1935, 1936, 1937, and 1938 have been made by Federal Grain Supervisors and reported annually by Field Headquarters, Chicago. In 1935 the center of production was southeast and northwest. A severe blight epidemic in the southwest was largely responsible for heavier buying in the northwest. In 1936 production was more favored in southeast Minnesota, southwestern counties in 1937, and in 1938 extended north of the two tiers of southern Minnesota counties, and into the Red River Valley. Blight and storm damage was severe in 1938 in the southern part of the state and resulted in heavy losses. Sample analysis showed 52 per cent of farm samples contained 4 per cent or more blight damage. Seasonal conditions appear to have affected the tightness of the hull, and skinned barley was a serious problem. Too close threshing was evident in that 27 per cent of the samples showed 5 per cent or more skinned and broken. (Table I.) However, this damage was not confined to southern Minnesota, and it appears that smooth-awned varieties require more care in threshing than the old style rough bearded varieties, if high quality malting territories are to be developed with these types.

Counties in the northern half of the state shipped 100 cars or 16.8 per cent of the crop, and the southern half 492 or 83.2 per cent. Total number of cars in 1938 was 592, as compared to 1,759 in 1937, for the months of August and September.

It will be of interest to note that in 1937, 65 per cent of the malting barley originating in Minnesota, marketed in the three principal markets, Minneapolis, Milwaukee, and Chicago for the same period was produced in 12 counties in southern Minnesota, namely, Jackson, Cottonwood, Redwood, Renville, Murray, Le Sueur, Kandiyohi, Nobles, Sibley, Olmsted, Watonwan and Brown. In 1938 six of these counties were in the top 11 which produced 57.6 per cent of the malting barley shipped, and eight of the 11 carried some phase of the market quality program. The 11 counties referred to are: Lyon, Redwood, Murray, Kandiyohi, Pipestone, Jackson, Faribault, Lac qui Parle, Yellow Medicine, Cottonwood and Renville in order of production.

Table IV. Use of Registered Barley Seed Stocks by Farmers in 24 Minnesota Counties

County	No. Samples With Incomplete Data	Farm-Run	Registered	Per Cent Registered
Carver	1	16	3	15.79
Dakota	-	2	12	85.71
Dodge	-	22	4	15.38
Faribault	1	33	15	31.25
Fillmore	18	27	6	18.18
Goodhue	3	21	3	12.50
Jackson	-	23	11	32.35
Kittson	1	28	2	6.67
Lac qui Parle	8	45	8	15.09
Le Sueur	-	15	-	-
Lyon	1	20	14	41.18
Marshall	5	72	14	16.28
Martin	1	33	14	29.79
McLeod	1	73	10	12.05
Murray	8	44	3	6.38
Nicollet	2	15	3	16.67
Olmsted	35	76	12	13.64
Redwood	13	18	4	18.18
Renville	4	72	8	10.00
Swift	20	84	24	22.22
Wabasha	1	27	8	22.85
Waseca	22	22	3	12.00
Winona	-	9	14	60.87
Wright	20	31	7	18.42

Average per cent registered seed for 24 counties 19.61

Meetings Conducted 1938-39. Barley and flax were featured in meetings in 28 counties. Publicity was handled thru the county agents and the Northwest Crop Improvement Association. In 15 counties Kodachrome slides illustrating grading factors and disease problems were used with very good results. Dr. R. J. Haskell, extension pathologist, Washington, D. C., prepared a series which created a great deal of interest, and proved invaluable in the meetings. The schedule for schools was closed October 31, 1938, which made it possible to plan an itinerary with a great deal of economy of time and travel. Counties planning to continue or develop the market quality program in 1939-40 are urged to keep this date in mind. Counties and towns in which meetings were held are as follows:

County	Town	Date	County	Town	Date
Goodhue	Red Wing	Nov. 29	Winona	Lewiston	Feb. 8
Faribault	Bricelyn	Jan. 9	Fillmore	Preston	Feb. 9
Murray	Slayton	Jan. 10	Scott	Jordan	Feb. 13
Jackson	Heron Lake	Jan. 11	Le Sueur	Le Center	Feb. 14
Cottonwood	Jeffers	Jan. 12	Nicollet	St. Peter	Feb. 15
Martin	Fairmont	Jan. 13	McLeod	Glencoe	Feb. 16
Swift	Benson	Jan. 23	Carver	Waconia	Feb. 17
Swift	Kerkhoven	Jan. 24	Steele	Owatonna	Feb. 20
Lac qui Parle	Madison	Jan. 25	Mower	Adams	Feb. 22
Yellow Medicine	Clarkfield	Jan. 26	Olmsted	Stewartville	Feb. 24
Lyon	Marshall	Jan. 27	Goodhue	Dennison	Feb. 27
Redwood	Wabasso	Jan. 28	Dakota	Rosemount	Mar. 1
Kittson	Hallock	Jan. 31	Dakota	Hampton	Mar. 2
Marshall	Argyle	Feb. 1	Waseca	Waldorf	Mar. 3
Renville	Hector	Feb. 3	Wright	Howard Lake	Mar. 6
Olmsted	Eyota	Feb. 7	Wabasha	Plainview	Mar. 20

Speakers at Meetings.

Willis B. Combs: Senior Marketing Specialist, Federal Extension Division, Chicago, Illinois

R. F. Crim: Extension Agronomist, University Farm, St. Paul, Minnesota

R. J. Haskell: Extension Pathologist, U.S.D.A., Washington, D.C.

F. R. Immer: Associate Professor, Department of Agronomy and Plant Genetics, University Farm, St. Paul

H. Milliman: Federal Grain Inspector, Minneapolis, Minnesota

H. Putnam: Executive Secretary, Northwest Crop Improvement Association, Minneapolis, Minnesota

W. W. Brookins: Extension Agronomist, University Farm, St. Paul, Minnesota

Minnesota Agricultural Extension Division cooperated with the following agencies:

Department of Agronomy and Plant Genetics
Northwest Crop Improvement Association
Minnesota Crop Improvement Association
Federal Grain Supervision Office, Minneapolis
Federal Extension Division, Field Headquarters, Chicago
County Agricultural Agents
Vocational Agricultural Instructors
Elevator operators, local businessmen and farmers
Minnesota Federation of County Fairs

Note. Other phases and details of this program have been described in mimeograph pamphlet 51, Quality Production, May, 1938, under "Suggested County Program".

Counties planning to initiate or continue the program in 1939-40 are advised that envelopes for shipping samples will be available for distribution from University Farm in July, 1939. Meetings will be scheduled in those counties which have filed a request on or before October 31, 1939. Number of samples submitted on or before December 15, 1939, will be used in determining the schedule of meetings unless counties are advised otherwise.

UNIVERSITY FARM, ST. PAUL, MINNESOTA

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